

Law of variable Proportion (or) Law of Diminishing Return

Law of Return to Scale

Short Run

Long Run

## CHAPTER - 3

## Theory of Production & Cost

### \* Meaning

According to James Bates and JR. Parkinson "Production is the organized activity of transforming resources into finished products in the form of goods & services and the objective is to satisfy the demand of humans.

Imp - Production is creation or addition of Utility to thing  
It is not Creation of matter.

### \* Types / Various Processes to add Utility

- By Gautam Gogia
- 1) Form Utility [wood into Table]
  - 2) Place Utility [Extraction of Gold & Supplying to Market]
  - 3) Time Utility [Availability of seasonal fruit in off season]
  - 4) Service Utility [By use of Personal skills]

### \* Factors of Production

- 1) Land - Natural resource
  - 2) Labour
  - 3) Capital
  - 4) Entrepreneur
- Human Endeavour

## ① LAND

- i) Land is free gift of nature
- ii) Supply of land is fixed Perfectly inelastic for economy  
Elastic for firm
- iii) Land is indestructible
- \* iv) Land is a passive factor (can't produce on its own)
- v) Land is immobile
- vi) " has multiple uses
- \* vii) " is heterogeneous (All parts are different)

## ② Labour \* Motive is economic Reward\*

- i) Human Effort
- \* ii) It is perishable & can't be stored
- \* iii) It is an Active factor
- iv) Labour is inseparable from labourer
- v) " power differs from labourer to labourer
- vi) All labour may not be productive
- \* vii) Labour has poor bargaining power
- viii) " is Mobile
- \* ix) No Rapid Adjustment for supply of labour
- x) Choice B/w hours of labour & Leisure

## ③ Capital [stock concept]

- \* Capital is a stock concept
- \* Periodical income out of Capital is a flow concept
- \* Capital is a part of wealth.
- \* Capital is "produced means of production"

MCO

- \* Land & Labour are primary or original factor of Production
- \* Capital is produced factor of production.

Types

- 1) Fixed Capital
- 2) Circulating Capital — Single use [★]
- 3) Real Capital — Physical goods
- 4) Human Capital
- 5) Tangible Capital
- 6) Individual — Personal property
- 7) Social — Patents

(\*)

Capital formation ← \* investment  
 \* (creating additional productive capacity)

Stages of Capital formation

- 1) Savings
- 2) Mobilisation of Savings
- 3) Investment

(4)

Entrepreneur ★

- 1) Initiating Business enterprise & resource Co-ordination
- 2) Risk bearing or Uncertainty bearing

\* Frank Knight is of the opinion that profit is the reward for bearing uncertainties.

- \* Uncertainties are different from Risk.
- \* '' can't be insured.

3) Innovations — Schumpeter told about innovations

## PRODUCTION FUNCTION

Relationship between inputs and outputs

$$Q = f(a, b, c, d, \dots, n)$$

\* Output is dependent variable

\* Inputs are independent

\* In this chapter only two inputs will be considered. ~~Land~~

(L) Labour & (K) Capital

\* Definition of Production Function is given by Samuelson.

Short  
Run

The law of Variable Proportion (or)

" Law of Diminishing Returns

\* This law is only used in Short Run

\* Short run means in which at least one input is fixed.

Quantity of one factor (Input) is increased, while other remain constant, it will lead to decline in MP

check Schedule from Book

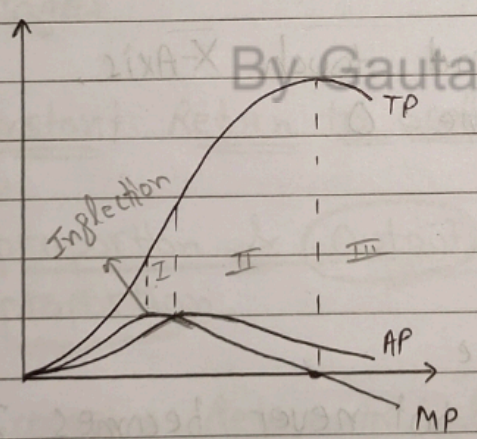
•  $TP = AP \times L$   
 $TP = \sum MP$

•  $AP = \frac{TP}{L}$   
 $L$  (Quantity on Input)

•  $MP_n = TP_n - TP_{n-1}$  (or)  $MP = \frac{\Delta TP}{\Delta L}$

Assumption

- It tells relationship b/w input & output but not profitability.
- Profitability is the part of Theory of Cost.



→ 1st stage start when MP is at Max.

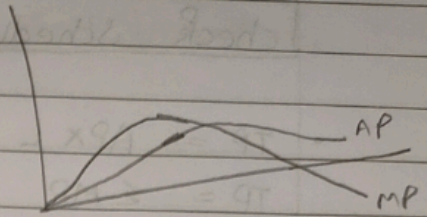
STAGE I = Increasing Returns

STAGE II = Diminishing Returns

STAGE III = Negative Returns

(\*) Relationship MP and AP

Stage I



- \* MP & AP both rises
- \*  $MP > AP$ , MP is above AP
- \* MP falls but AP rises, still  $MP > AP$
- \* MP intersect AP curve from above @ Point on intersection  $MP = AP$

Stage II

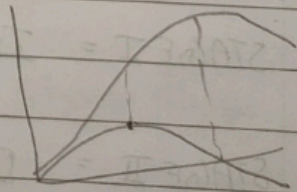
- \* Both AP & MP curve falls
  - \* But AP is above MP (fall of MP is greater than AP)
  - \* MP becomes 0 and touch X-axis, but AP never become 0.
- Extra Knowledge  
Fall in MP is double than AP

Stage III

- \* MP become Negative
- \* AP is still falling but never becomes Zero

(\*) Relationship of TP & MP

Stage I



- \* Initially TP & MP rises, i.e. TP increases at increasing rate.
- \* At the point of Inflection, MP falls & TP rise at diminishing rate.

## Stage II

- \* TP increases at diminishing Rate & MP is still decreasing.
- \* MP reaches to 0 & TP is at its Maximum.

## Stage III

- \* MP becomes Negative & TP starts falling.

## Law of Return to Scale [Long Run]

- \* Long Run - when all factors are variable.

### Stages

By Gautam Gogia

$a+b=1$  • Constant Return to Scale ÷ When inputs are increased in some proportion & Outputs are increased in same proportion.

$a+b>1$  • Increasing Return to Scale ÷ Proportinate increase in output is more than increase in input.

$a+b<1$  • Decreasing Return to Scale ÷ Proportinate increase in output is less than increase in input.

$$Q = K^a L^b C^c \quad \text{[Cobb-Douglas]}$$

combination of Inputs, that give same output at each level,  
with Diff Cost      1/1

## PRODUCT OPTIMISATION

→ Combination of different inputs that gives same output with different cost.

It can be known by combining firm's Production & Cost function.

↓  
isoquants

↓  
isocost

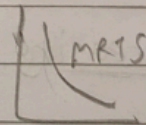
\* (1) Isoquant ÷ Combination of Inputs, that are capable of producing same level of output.

\* Also known as equal-product curves, production IC or iso-product curves.

\* It is same as IC but it is study of some level of output at a IC curve.

\* It is studied for Producer

\* Convex in shape (-ve slope)



\* MRTS (marginal rate of technical substitution)  $\frac{\Delta Y}{\Delta X}$

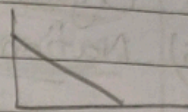
\* MRTS is the slope of ISO Quant.

\* Imp Difference

\* In Consumer IC it is not possible to quantify satisfaction.

2) In Producer IC it is not possible to quantify output.

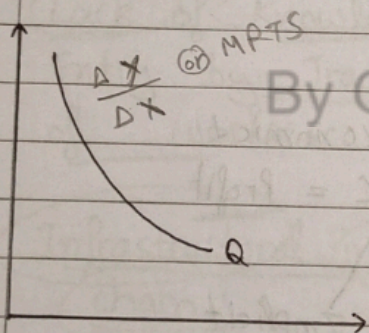
2) Isocost (or) Equal Cost Lines



\* Known as Budget Line (or) Budget Constraint Line

\* It shows the various alternative combinations of two input factors the firm can buy with given budget.

Slope =  $\frac{\Delta Y}{\Delta X}$  (or)  $\frac{P_x}{P_y}$  It is -ve slope



Isoquant

(or)

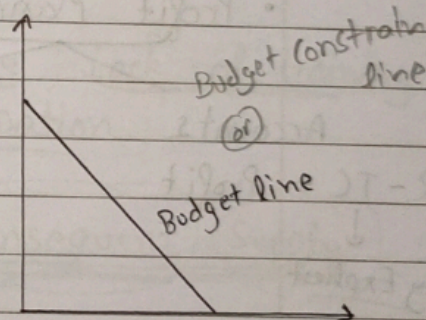
Equal Product Curve

(or)

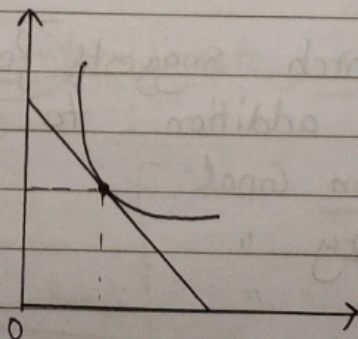
IC

(or)

Iso Product Curve



Iso Cost



Least Cost Combination of Factors = Producer Equilibrium.

## Enterprise's Objective

- 1) Organic
- 2) Economic
- 3) Social
- 4) Human
- 5) National

①

### Organic Objective

- Survive or to stay alive
- recover its cost
- Aim at growth & Expansion
- R.L Marris theory of Firm assumes that goal of managers is to maximise the firm's balanced growth.

②

### Economic Objective

- Profit Maximisation

Accounts

$$TR - TC = \text{Profit}$$



only Explicit

Economic

$$TR - TC = \text{Profit}$$

Explicit + Implicit

↓  
opportunity  
cost

\* Cyert & March suggests four possible functional goals in addition to profit.

- Production Goal

- Inventory "

- Sales "

- Market Share "

- Profit

Total 5

\_ / \_ / \_

### ③ Social Objective

- ★ maintain
- Non-Milavati  
↑
- Supply of unadulterated goods
  - Avoid profiteering & anti social practices
  - Not cause pollution - air, water or noise.

### ④ Human Objectives

- Employee development

### ⑤ National Objective

while pursuing objective, an enterprise may get constrained by many factors ÷

Profit Maximisation  
↖

- Lack of Knowledge and Information
- Entry by Trade Unions, Satate, Lack of training of workers to change occupation.

★ MCO • Infrastructural inadequacies and consequent supply chain

- Change in Business and Economic conditions (Govt Policies)  
Natural Calamities

★ • Inflation, rising interest rate, Exchange rate fluctuations.

## Enterprise's Problems,

- Setting Objective & balance among different objectives.
- Location & Size of Plant
- Selection & Organisation of Physical facilities
- Problem of Finance
- " Relating to Organisational Structure
- " " " Marketing 4 P's
- Legal formalities
- ★ Industrial Relations (co-operation among workers)

## Cobb - Douglas Production function

- Paul H. Douglas & C.W. Cobb of USA. studied the production function of the American manufacturing industries.

★ \* whole Manufacturing not individual firm.

Original  $Q = KL^a C^{(1-a)}$

Here  $a+b=1$  So, Constant Return to Scale.

Revised  $Q = KL^a C^b$

If  $a+b > 1$ , Increasing Return to Scale

If  $a+b < 1$  Dec Ref to scale.

Conclusion from this study is that Labour contribute about 3/4<sup>th</sup> & Capital about 1/4<sup>th</sup>.

By Gautam Gogia

ch-3 UNIT-2

## Theory of Cost

### \* Cost Concepts

1) Accounting & Economic Cost (Already covered)

2) Outlay and Opportunity

~~Outlay / Notional~~ = ~~B~~

- Outlay / out of Pocket = Explicit
- Imputed / Notional = Implicit

3) Direct or Traceable ÷ Direct relation with product,  
By process or Department.

Indirect or NonTraceable ÷ Not Easily Identifiable  
Ex- Electric power, general operation  
benefiting all products jointly.

<sup>MC</sup>  
4) Incremental Cost ÷ Related to concept of MC.  
Additional / Extra

Example ÷ change in product line, Replace worn out machinery, buy new production facility, acquire new set of clients.  
Depreciation  
Machinery

It is Relevant for Decision Making.

\*

• Sunk cost ÷ cost which are already incurred and can't be recovered.

★ MCO Example ÷ Advertising, R&D, Specialised equipment and fixed Facility such as Railway line.

★ MCO

- \* Not considered for decision Making
- \* Important barrier to entry of firms into business.

5) Historical Cost and Replacement Cost

↳ Cost Incurred in the past to buy <sup>new</sup> asset.

Replacement Cost ÷

↳ Expenditure incurred for replacing an old asset.

Imp \* other things remain constant, an increase in the price of asset will make replacement cost higher than historical cost.

6) Private Cost ÷ Actually incurred by the firm.  
i.e. Explicit & Implicit.

Social Cost = Private + External

borne by Society Such as Rivers, atmosphere, Roadways.

★ MCO 7) Fixed cost ÷ Not a Function of Output

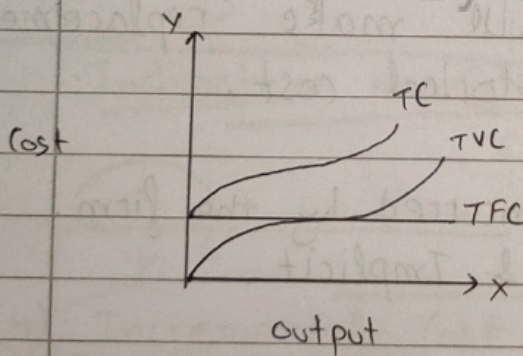
★ Variable cost ÷ Function of Output

## Cost Function

- Cost function refers to mathematical relation between cost of product and various determinant of cost.  $\rightarrow$  MCQ
- It is obtained from Production function
- It is relationship b/w costs & output
- Shape of cost curves depends upon the cost function.
- Cost function is of two type Short Run & Long Run.

SHORT RUN (output) increase with increase in TVC, & TFC remain constant

$$TC = TVC + TFC$$



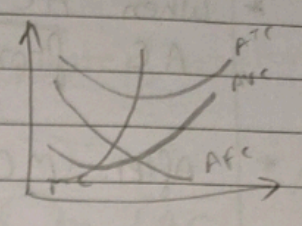
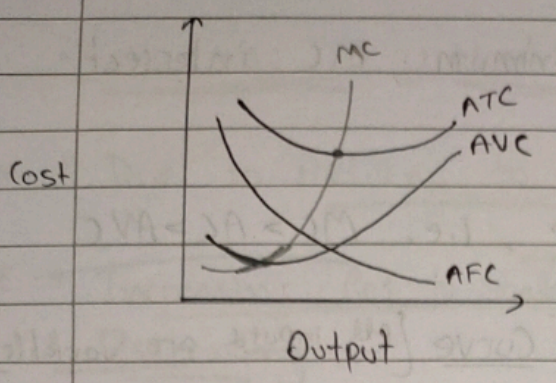
- Average Cost  $\left[ \frac{\text{Total Cost}}{\text{No. of unit}} \right] \rightarrow$  MCQ

$$ATC = AFC + AVC$$

$$ATC = \frac{TC}{Q}$$

$$AFC = \frac{TFC}{Q}$$

$$AVC = \frac{TVC}{Q}$$



Marginal Cost MC

$MC = \frac{\Delta TC}{\Delta Q}$  (or)  $\frac{\Delta TVC}{\Delta Q}$  ] only in short run, because TFC remain same

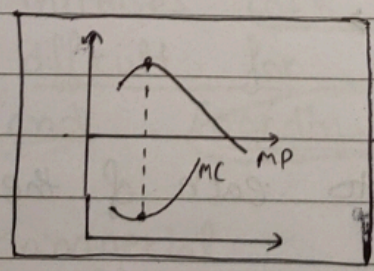
$MC = TC_n - TC_{n-1}$  (or)  $MC = TVC_n - TVC_{n-1}$  ]  $\uparrow$

Relationship of AC, AVC, MC

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\* Initially Output increases, AC, AVC, MC Falls.  
also AC > AVC > MC

\* \* MC reaches at its Minimum [on cost minimum, in production MP Inflation  
↳ Point of Inflexion Maximum]



↳ Extra Knowledge

\* \* MC starts rising but AC & AVC are still falling.

\* \* MC intersect AVC at its Minimum.

\* After point of inflexion, MC & AVC, rise but ATC still Falls.

Here,  $AC > MC > AVC$

\_/\_/\_

\* When AC reaches its Minimum, MC intersect AC from below.

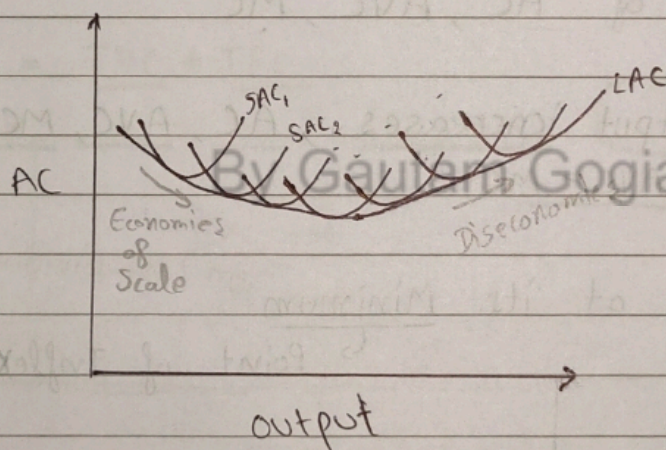
\* After MC = AC, AC rise, i.e. MC > AC > AVC

Long Run Average Cost Curve [All inputs are variable]

\* LAC is derived from, multiple SAC

\* (SAC) are also called Plant Curve

\* Firm has a choice between choosing a plant (SAC) which yields minimum possible unit cost.



\* LAC is drawn tangent to each of the SAC.

\* LAC is not tangent to the minimum point of SAC, while LAC is declining, it is tangent to falling portion of SAC & vice versa.

\* LAC is often called as 'Planning Curve', 'Envelope Curve'

• Why LAC is U shape ?

★ \* Due to Returns to Scale (Production chapter, Long Run)

★ \* Increasing Ret to Scale causes Fall in LAC

★ \* Decreasing " " " " Rise " "

★ \* Inc Ret to Scale is due to internal & External economies of scale.

\* Dec Ret to Scale is due to internal & External Diseconomies of Scale.

★ \* Modern Firm's LAC is L-shaped.

Economies & Dis economies of Scale  
↳ Large scale production

Internal

① Technical

Econom

- Decrease in Per unit Cost

Dis Eco

- When Scale of Operation become very large, it increases cost of management & also become difficult for management to exercise control and Coordination.

② Managerial

★ MCR

- Work is divided to specialised department  
- After a certain Limit, Managerial structure becomes more complex and is affected by

bureaucracy, red tapism, lengthening of Communication, delays in decision making.

\_/\_/\_

### ③ Commercial

- Bulk orders, large productivity leads to reduction in per unit cost of Advertisement Marketing etc.
- After the optimum scale advertisement Exp and other marketing overheads will increase more than proportionately.

### ④ Financial

- Raise Capital at Lower Cost
- \* - Relatively greater dependence on External factors.

### ⑤ Risk Bearing

#### External

Benefit enjoyed by firms due to Growth of Industry

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① Cheaper Raw material & Capital Equipment

② New Technological Advancements

③ Development of Skilled labour

\*MCR ④ Growth of Ancillary Industry  
↳ Repair Part, Spares, tools etc.

⑤ Better transportation and Marketing facilities

⑥ Economies of Information  
↳ Booklets & Bulletins by Industry associations.

## Economies

### Technical

- Reduce per unit cost

### Managerial

- Divide work to specialized department

## Dis economies

### Technical

- Inc Cost of Management
- Difficult for Management to Exercise Control & Coordination

### Managerial

- Structure become complex & lead to Bureaucracy, Red tapism, delay in Decision

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